




# ISPM 15

## Scientific Technical Issues




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## Overview of ISPM science issues



- Economic damage caused by pests
- Pest interceptions on treated wood packaging
- Scientific basis of treatments

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How can science help make improvements to ISPM 15?


## International Forestry Quarantine Research Group

- Advisory body to the IPPC providing scientific analysis and review of global phytosanitary issues and new information
- Identify and undertake collaborative scientific research aimed at high priority forestry quarantine questions






## Pest Risks Reduced by ISPM 15



Before ISPM 15:




Untreated wood with bark




Cable spools:  
25% with live insects







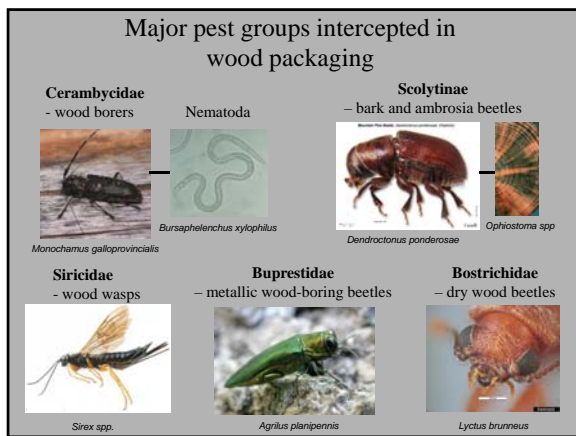
## Quarantine rearing of spruce bolts used to brace granite blocks





Fungi, nematodes,  
and insects  
(2408 of 28 species)



Bark beetles and wood borers commonly intercepted and are known to be serious quarantine pests

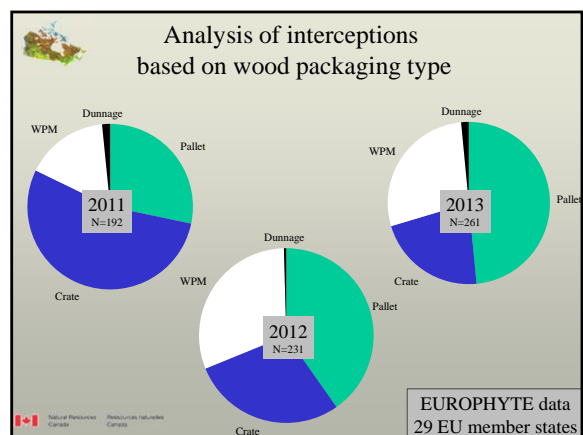
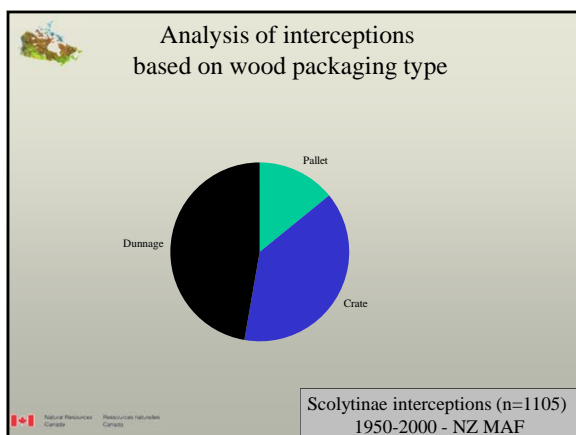
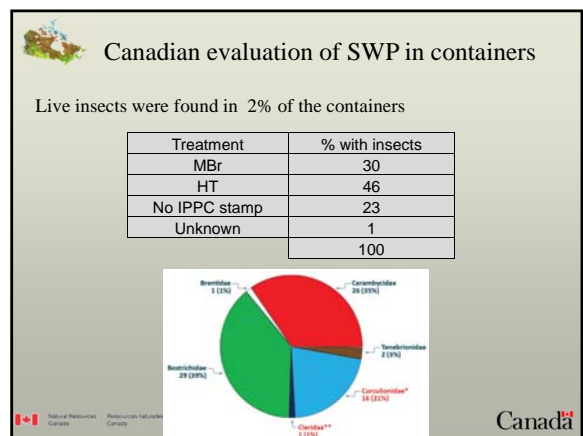
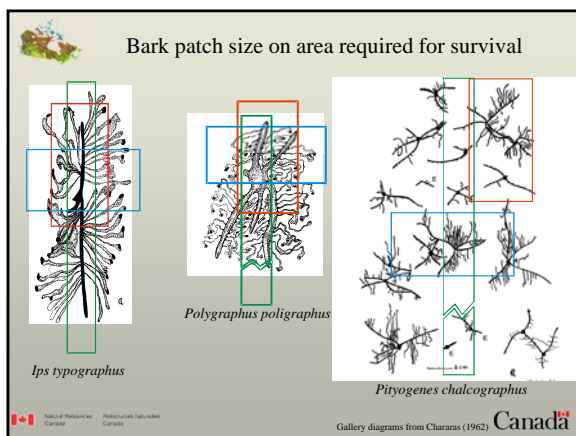
21 species of Scolytinae and Cerambycidae established in the US from 1909–2008

- IFQRG bark infestation study results (UK, US, Germany, Canada)

Bark less than 3 cm wide or 50 square cm are very low risk

- too small for insects to complete life cycle
- dries quickly to become undesirable for insects

This led to changes in 2009 revision to ISPM 15





### Economic damage caused by pests

Several recent studies:

**Aukema et al. 2011. Economic Impacts of Non-Native Forest Insects in the Continental United States**

Annual Wood Borer Damage (\$US x 10 <sup>6</sup> )	
Federal Government	92
Local government	1700
Household	760
Property loss	830
Forest timber loss	130
<b>Total</b>	<b>3.5 billion dollars</b>



**McKenny et al. 2013. Estimates of the potential cost of emerald ash borer (*Agrilus planipennis*) to Canadian municipalities**

The researchers estimated costs associated with mortality of street and homeowner trees over 30 years and concluded:

“damage was estimated from \$265 - \$1,177 million depending on the combination of spread, treatment, and discount rates”



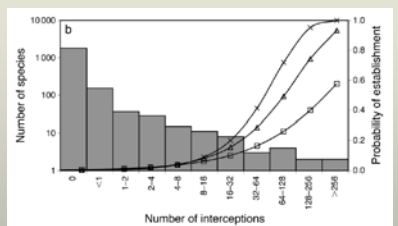
**Leung et al. 2014. Pathway-level risk analysis: the net present value of an invasive species policy in the US.**

The researchers integrated estimated damage costs with policy implementation costs (treatment, trade effects) and concluded:

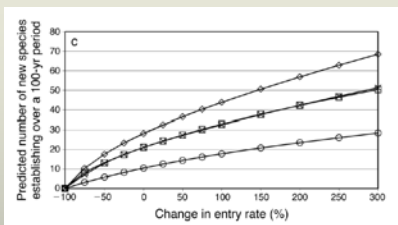
“Implementation of ISPM 15, although costly and yielding only moderate protection, can generate >US\$ 11 billion in cumulative net benefits by 2050”



### Reducing establishment of pests



Brockerhoff et al. (2014) modelled pest arrival rates and probability of establishment. Species with low arrival rates are more likely to be mitigated than those with more frequent arrival.



Establishments will still occur, especially with high-arrival rate pests, even when entry rates are lowered 50-75%.



**Haack et al. 2014. Effectiveness of the international phytosanitary standard ISPM No. 15 on reducing wood borer infestation rates in wood packaging material entering the United States.**

Comparing pre- and post-ISPM 15 interception rates:

	Pre-ISPM 15	Post-ISPM 15	% reduction
<b>US</b>	0.17-0.25%	0.11-0.12%	36-52
<b>Chile</b>	0.181	0.096	47



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Possible reasons:

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- Infestation following treatment
- Treatment not applied properly
- Fraud

Careful analysis of interceptions can help focus efforts to improve the effectiveness of ISPM 15



### Scientific Basis of Treatments

#### Fumigation – methyl bromide

Exposure to methyl bromide is lethal to life stages of most living organisms

- 60 years of data showing MB use for wood products
- Effective for insects, fungi, nematodes
- Treatment success dependent on proper application
  - temperature, wood thickness, maintaining fumigant concentration
- Alternative fumigants being assessed



### Scientific Basis of Treatments

#### HT

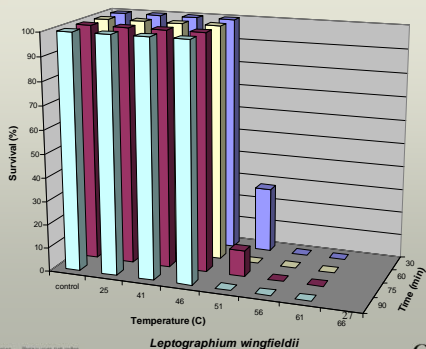
Exposure to high temperatures (50-60° C) is lethal to most living organisms

#### 56° C for 30 min

- 80 years of data showing HT efficacy
- 1991 study - pinewood nematode and most adult and larval stages of insects
- recent research - wide range of decay and stain fungi
- outside of wood receives higher temperature, longer time



### Heat treatment studies on fungi

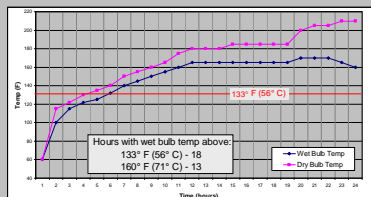


### Maximum survival temperature for fungi (30 min exposure)

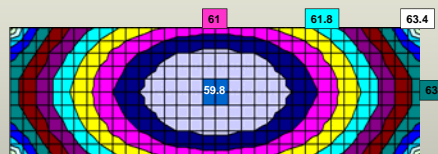
<i>Leptographium wingfieldii</i>	51°
<i>Leptographium wagneri</i>	46°
<i>Ophiostoma polonica</i>	46°
<i>Ceratocystis fagacearum</i>	46°
<i>Armillaria ostoyae</i>	51°
<i>Heterobasidion annosum</i>	46°
<i>Phellinus noxius</i>	51°
<i>Gloeophyllum sepiarium</i>	66°
Thermotolerant, non-quarantine pest	

### Effective Heat Treatment Approaches

- Different approaches to heat treatment monitoring
  - Ensuring consistent delivery of heat to all pieces of wood
  - Single or multiple probes
  - Kiln schedules (Canadian approach)
- Where heat chambers operate at ambient temperatures higher than 56° outer parts of wood achieve much higher temperatures
- Thermal models predict temperature throughout wood



### Kiln schedule approach – wood treated hotter, longer



Temperature profile of *Pinus* sawn wood at the end of a 509 minute schedule. Generally this temperature maintained for a further 30+ hr



## Summary

- Quarantine pests moving with wood packaging are known to cause significant social, ecological and economic impacts.
- Implementation of ISPM 15 is shown to have net economic benefit over time
- Fumigation and HT treatments are effective for most pests when applied correctly
- Compliance with ISPM 15 will lower pest arrivals and subsequent establishments but some will still occur.



## What next?

The ultimate goal of ISPM 15, reducing pest establishments, can be improved by:

- Ensuring that new treatments are effective, especially against high arrival-rate pests
- Improved application of treatments
- Improved systems to ensure that treatments are properly applied



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